MP5 Report

A1.
Time update
$xk = Axk-1 + Buk-1$
$Pk - = APk-1A$^T + Q

In order to calculate time update xk we compute xk previous and use uk our data. Xk is initially [0,0] but then in a loop we will compute a more precise xk based on the data uk. We compute xk_time update or xk_time by x_time = xk previous + uk.

In order to calculate Pk we add our system noise Q to Pk in every iteration. Q is the given matrix in the pdf. Pk_time = pk + Q

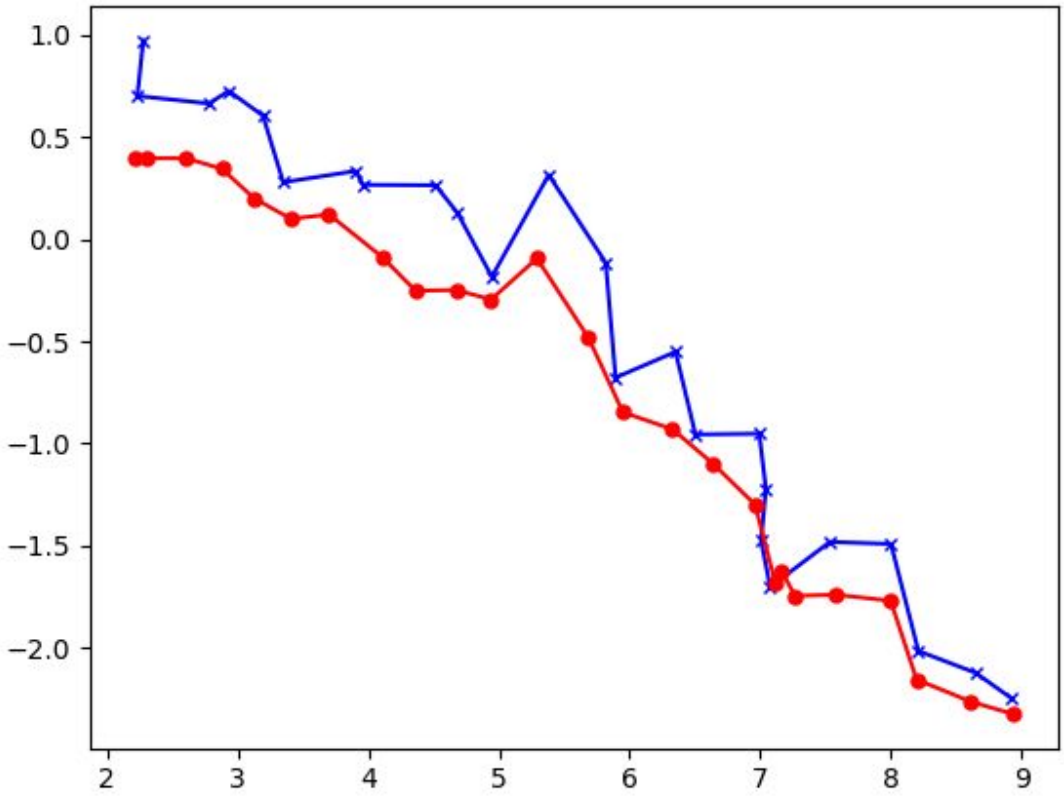
Measurement update
Xk = xk + Kk(zk - HxK)
Kk = pkH^T/(HpkH^T+R)
Pk = (I -KkH)pk

In order to calculate measurement update Xk we must first calculate Kk. kk is calculated by taking pk from time update and multiplying it by the inverse of calculated pk from time update + the given measurement noise.

Now that we have Kk we can calculate xk measurement. Xk measurement = xk from time update + Kk dot product with the difference of zk - xk (time update). Zk is from the given data.

Lastly we can calculate pk for measurement update. All we have to do is dot product the matrix from time update by the difference of the identity matrix and Kk.

A4. After testing multiple lambda values for the P = λI equation we chose the lambda value 0.3285 which we believed yielded the best results after testing. Below is the graph of or observation and estimates. Observation being red and estimates being blue.


1.0
0.5
0.0
−0.5
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2
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